ASTRONOMY AND ASTROPHYSICS

A European Journal

Volume 1 1969

Published by Springer-Verlag Berlin · Heidelberg · New York
on behalf of the Board of Directors

Astronomy and Astrophysics

A European Journal

Board of Directors

Chairman: A. Blaauw (ESO)
Vice Chairman: B. Strömgren (Denmark)
Secretary and Treasurer: Y. Mazières (France)

L. Biermann (Germany)
H. G. van Bueren (The Netherlands)
J. Delhaye (France)
Ch. Fehrenbach (France)
W. Fricke (Germany)
G. W. Funke (Sweden)
J. H. Oort (The Netherlands)
E. Schatzman (France)
A. Unsöld (Germany)
A. G. Velghe (Belgium)

Editors-in-Chief 1969-72

S. R. Pottasch
Kapteyn Astronomical Laboratory
Broerstraat 7,
Groningen (The Netherlands)

J. L. Steinberg
Observatoire de Meudon
92 Meudon (France)

Editing Secretaries

Mrs. M. Steinberg
Miss G. I. van der Wal

Board of Editors

W. Becker (Basel)
A. Behr (Hamburg)
E. J. Blum (Meudon)
E. M. Burbidge (La Jolla)
G. M. Clemence (New Haven)
Ph. Delache (Nice)
P. Felenbok (Meudon)
G. B. Field (Berkeley)
S. C. B. Gascoigne (Canberra)
M. Hénon (Nice)
G. H. Herbig (Lick Obs.)
G. Herzberg (Ottawa)
L. Houziaux (Mons)
H. C. van de Hulst (Leiden)
C. de Jager (Utrecht)
F. D. Kahn (Manchester)
R. Kippenhahn (Göttingen)
H. van der Laan (Leiden)
P. Ledoux (Liège)
J. Lequeux (Meudon)
P. O. Lindblad (Stockholm)
R. Lüst (München)
R. Michard (Meudon)
M. G. J. Minnaert (Utrecht)
B. Morando (Paris)
J. C. Pecker (Meudon)
S. I. Rasool (New York)
J. Rösch (Obs. Pic du Midi)
M. Ryle (Cambridge)
D. H. Sadler (Herstmonceux)
M. Schmidt (Pasadena)
F. G. Smith (Jodrell Bank)
P. Swings (Liège)
A. B. Underhill (Utrecht)
H. Van Regemorter (Meudon)
J. P. Wild (Sydney)
L. Woltjer (New York)

The exclusive copyright © for all languages and countries, including the right for photomechanical and other reproduction, is vested in European Southern Observatory (ESO)

The quotation of registered names, trademarks, etc. in this journal does *not* imply, even in the absence of a specific statement, that such names are exempt from laws and regulations protecting trademarks, etc. and therefore free for general use.

Springer Verlag · Berlin · Heidelberg · New York

Printed in Germany

Druck: Brühlsche Universitätsdruckerei, Gießen

Volume 1 1969

Contents

A. Blaauw: Introduction 1

Stars and Stellar Evolution

L. Martinet and M. Mayor: A Comparative Study of Motions for Nearby Stars of Various Luminosity in Connection with Problems of Stellar Evolution 19

R. Rocchia, R. Rothenflug, D. Boclet and Ph. Durouchoux: Observation of Five Sources of Cosmic X-Rays in the 15–150 keV Energy Range 48

M. Spite: Calcium Abundance in 99 Herculis 52

R. Kippenhahn and L. Smith: On the Ages of delta Cephei Stars 142

H. Mauder and U. Köhler: The Eclipsing Variable χ^2 Hya = BV 722 147

P. Baize: Orbital Elements of the Visual Double Star ADS 12145 = Se 2 164

S. Refsdal and A. Weigert: Evolution with Mass Exchange in Close Binary Systems of Total Mass 2.5 $M_\odot$ 167

K. H. Böhm: Atmospheres and Extended Envelopes of Central Stars of Planetary Nebulae 180

M. Arnould and C. Brihaye: Possibility of Synthesis of Proton Rich Nuclei in Highly Evolved Stars 193

Tomokazu Kogure: Emission Profiles of "Pole-on" Be Stars 253

K. S. Krishna Swamy: Atmospheres of Metal-Deficient Stars: Main Sequence Stars 297

M. Gabriel: On the Temperature Gradient in a Semi-Convective Region 321

Anne B. Underhill: Radial Velocities of Stars in the Vicinity of the Open Cluster NGC 7380 356

Klaus Fricke: Stability of Rotating Stars II. The Influence of Toroidal and Poloidal Magnetic Fields 388

Ch. Fehrenbach and M. Petit: Behaviour of Narrow Ca Absorption Lines in Nova Delphini 1967 403

K. Serkowski and W. Chojnacki: Polarimetric Observations of Magnetic Stars with Two-channel Polarimeter 442

M. A. J. Snijders: The Abundance of Iron in the B 2 Stars ζ Cassiopeiae and γ Pegasi 452

R. N. Henriksen: On the Shell Instability of Pleione 457

Galactic Structure, Stellar Dynamics, Interstellar Matter

R. R. Weber, R. G. Stone and C. R. Somerlock: Cosmic Radio Noise Intensity from 0.45 to 3.0 MHz Observed by the ATS II Satellite 44

P. Katgert: A Remnant of a Large-Scale Explosive Event in the Galactic Plane Around Longitude 60° 54

S. d'Odorico, R. Sancisi and S. C. Simonson, III: 21-cm Observations at Low Latitudes in the Direction of the Galactic Centre 131

H. R. Dickel, H. Wendker and J. H. Bieritz: The Cygnus X Region. V. Catalogue and Distances of Optically Visible H II Regions 270

Meera Aggarwal, Gita Bhowmick and S. P. Talwar: Hydromagnetic Stability of a Spiral Arm Embedded in a Gravitating Medium 374

M. Rasiwala: Dynamics of H II Regions with the Central Star in Motion 431

R. Crillon and G. Monnet: Kinematic Study of Ionized Hydrogen in NGC 4449 449

G. L. Verschuur: High Resolution Observations of a High Latitude Neutral Hydrogen Concentration 473

P. R. Wesselius: An H I Concentration at Latitude + 69°, Longitude 103° 476

Galaxies, Cosmology

M. Guélin and L. Weliachew: Neutral Hydrogen Distribution and Dynamics in Galaxies. 1. Reduction Procedures 2

M. Guélin and L. Weliachew: Neutral Hydrogen Distribution and Dynamics in Galaxies. 2. Study of the Spiral Galaxy NGC 2403 10

R. Louise and G. Monnet: Electron Temperatures in H II Regions 153
F. Biraud: Polarization Measurements with the Nançay Radiotelescope 156
J. M. Deharveng and A. Pellet: Interferometric Study of M 31 North-East Arm 208
S. Souffrin: Study of Nuclei of Seyfert Galaxies. II. Physical Description 305
S. Souffrin: Study of Seyfert Galaxies. III. Ionization Mechanism 414
G. Carranza, R. Crillon and G. Monnet: Kinematic Study of Ionized Hydrogen in M 51 479

The Sun

G. Stellmacher: Spectroscopic Analysis of Faint Prominences 62
Y. Leblanc and A. M. Le Squeren: Dimensions, Temperature and Electron Density of the Quiet Corona 239
C. Lacombe and A. Mangeney: On Some Characteristic Features of Type IV Bursts. Part III: Electron Acceleration in a Collisionless Shock Wave in the Solar Corona 325
Y. Leblanc: The Correlation Between Coronal Enhancements Observed at 5303 Å and 6374 Å and Radio Condensations at a Frequency of 169 MHZ 467

Physical Processes

A. J. Barnard, J. Cooper and L. J. Shamey: Calculated Profiles of He I 4471 and 4922 Å and their Forbidden Components 28
O. Bely and P. Faucher: The Two-Photon Transition Probabilities from the Metastable $2\,^3S_1$ State in the Helium Like Series 37
M. Blaha: Collision Excitation of Positive Ions in p^q Configurations: Transitions Between Levels of the P Term. Part II 42
E. Roueff and H. Van Regemorter: Spectral Line Broadening due to Atomic Collisions 69
E. Dekker: Calculation of the Multiplet Factor for more Complicated Transitions in L. S.-Coupling 72
S. Sahal-Bréchot: Impact Theory of the Broadening and Shift of Spectral Lines due to Electrons and Ions in a Plasma 91
D. Petrini: The Excitation Cross-Sections in Fe XIV 139
O. Bely and S. B. Schwartz: Ionization of Highly Charged Positive Ions 281
G. C. Pomraning and R. Froehlich: An Eigenfunction Analysis of the Heavy Electron Model of Compton and Inverse Compton Scattering 286
R. Gayet, D. Hoang Binh, F. Joly and R. McCarroll: Influence of Dielectronic Recombination on the Radio Recombination Lines of Carbon 365
P. K. Bhatia: Gravitational Instability of a Plasma with Finite Larmor Radius 372
P. K. Bhatia: Larmor Radius and Collisional Effects on the Gravitational Instability of a Plasma 399
J. Schramm: Total Cross-section Measurements for 4 P-Term Electron Impact for Ca I and Ca II 409

Celestial Mechanics and Astrometry

J. Roels: Resonant Long Period Orbits Around Lagrange's Equilateral Points. I. Critical Mass Ratio μ_3 77
M. Hénon: Numerical Exploration of the Restricted Problem. V. 223
S. Débarbat: Nearly Diurnal Nutation and Periodic Terms in Local Coordinates 334
J. Roels: Resonant Long Period Orbits Around Lagrange's Equilateral Points. II. Critical Mass Ratio μ_k $(k \geqq 4)$ 380
A. Deprit and J. F. Price: Phase Space Around L_4 in the Case of a Resonance of 1/3 427

Research Notes

Y. Biraud: A New Approach for Increasing the Resolving Power by Data Processing 124
Nguyen-Quang-Rieu: Estimation of Errors on the Characteristics of a Radio-Signal 128
W. D. Heintz: Orbits of Six Visual Binaries 249
P. Lantos: A Partial Physical Explanation of the Relations between Solar Activity and cm-λ Emissions 492

Letter to the Editor

Anne B. Underhill: On the Low Hydrogen Content of the Ia Supergiants of Type B 494